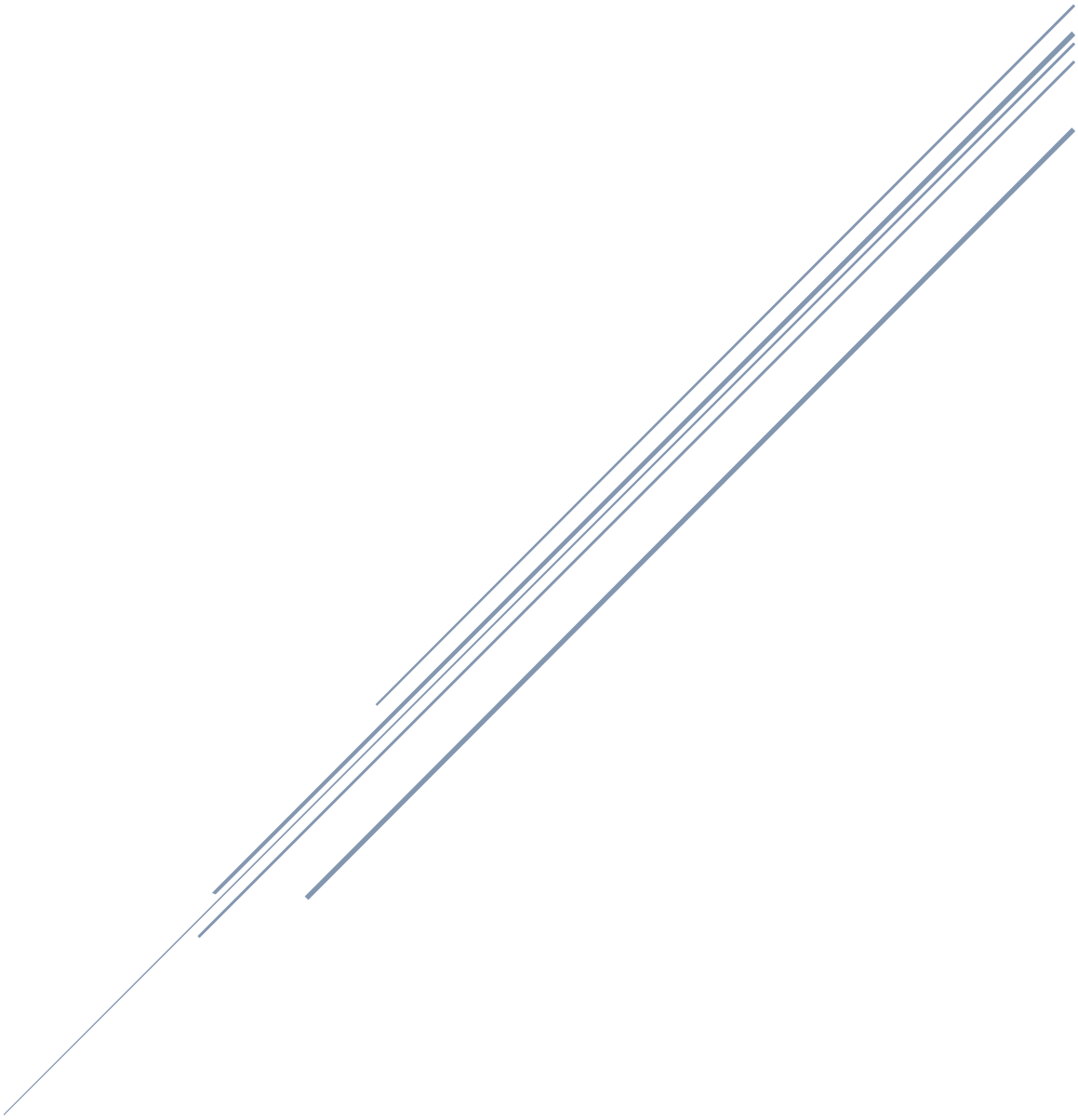
# AIRBORNE AG SYSTEMS LLC

## Operational Risk and Safety Manual



**OPERATIONAL RISK AND SAFETY MANUAL**

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# AIRBORNE AG SYSTEMS LLC, OPERATIONAL RISK AND SAFETY MANUAL

Risk: UAS Lost Signal, UAS Low Battery, UAS Lost Visual Line of Sight.

a. Mitigation: In the T-30, Airborne Ag systems LLC, utilizes DJI MG App 2.0, the software programming come with the flight controller, which contains a Return to Land (RTL) feature which will navigate the UAV to a certain RTL altitude, then transport the UAV to the location of takeoff, unless overridden with a new home location.

The UAV control is then returned to the pilot to land. RTL activates in the case of:
i. Lost RC signal.
ii. Low battery.
iii. RTL can be activated at any point by the pilot, such as loss of visual line of sight or loss of control of the UAV by the pilot.
b. Mitigation: In the T-30, Airborne Ag systems LLC, uses a DJI App built into the flight controller which has the same features as those described above for the T-30.

Risk: Flight over unwanted area.

a. Mitigation: Airborne Ag systems LLC, use of DJI App 2.0 and mission planning software called DJI App 2.0 Mission Planner permits it to create geofenced areas that prohibit flight paths over unwanted terrain. Moreover, the UA will remain in VLOS. The operator will manually control the UAS to avoid flight over unwanted areas as needed.

Risk: Failure of mission planner software.

a. Mitigation: Airborne Ag systems LLC, operators are able to manually take control of the UAS at any given time. Airborne Ag systems LLC, utilizes a radio controller manufactured by DJI that is an industry standard model and includes a toggle switch to transition from programmed to manual flight control. This permits operators to observe the UAS in flight and take over for any reason.

Risk: UAS Flyaway.

a. Mitigation: Flyaways can occur for a variety of reasons, most commonly UAS misconfiguration (compass), lack of following pre-flight checklist (setting RTL location/home), or operator error. Airborne Ag systems LLC, mitigates this risk through the ability to take control of the UAS at any time using the radio controller as described above.

b. Mitigation: The flights are conducted in areas that are remote, have controlled access, and all persons in the area are under the control of Airborne Ag systems LLC The flight time of the UAS mitigates the risk by flyaway to more populated areas.

c. Mitigation: Airborne Ag systems LLC, has added a redundant failsafe in the case of a fly away violating the flight controller's fail safes and manual takeover control. In this instance, locating the UAS after its limited flight time would be important to verify the crash site has been appropriately managed, recover the UAS to preserve the natural environment, and review the software and hardware to determine the cause of the error. To enable this, the company has attached a beacon locator that works in areas without cellular service and provides a heading and signal strength readout for the

beacon's current location and distance respectively. This heading is updated every few seconds. The beacon tag is affixed to the drone at all times. It is charged and powered on immediately prior to operation. The operator can locate the UAV by following the readout and walking towards the signal repeat until the drone is in visible sight. Range of the product is specified as line of sight: up to 2 miles typical. Open terrain, rolling hills with few obstructions: up to .5 – 1 mile.

Risk: Inclement weather.

a. Mitigation: Airborne Ag systems LLC, flies a custom UAV body that it has augmented with a weatherproof housing and weatherproofing measures for the electronic speed controllers. This provides some protection and allows us to fly under light rain. In the event of a quick downpour, this housing allows the operator to return the aircraft home, or quickly land it, before systems begin to fail.

Risk: Tank puncture or leak.

a. Mitigation: Airborne Ag systems LLC, utilizes a composite tank, (combined with safe storage and transportation practices). The structural properties of the tank provide us allow degree of risk to punctures and chemical spillage resulting from regular operations. The use of a small UA with a small capacity tank reduces the risk created by a complete tank failure as compared to the failure of a large tank on a larger unmanned aircraft or a much larger manned aircraft.

Risk: Software error causes operational issues.

a. Mitigation: The navigational and flight control equipment are OEM components from large equipment manufacturers (DJI), selected for being common, well-supported, and safe due to the millions of hours of testing by the manufacturer and iterative improvements caused by users in the field reporting errors (as opposed to being purchased from companies that are selling prototype and initial-run units prone to manufacturing and engineering problems).

5. Risk: Malfunction of spraying equipment (nozzles, pumps, tubing) causes spray of target that should not be sprayed.

a. Mitigation: TeeJet spray nozzles are a common or standard nozzle for agricultural spraying operations. Teejet manufactures nozzles for precision applications, irrigation lines, backpack sprayers, and other ground-based pesticide and fertilizer applications. The aircraft will use 2 off-centered, flat-fan-pattern nozzles that produce a straight five-foot wide swath when sprayed from 5 feet above a target. TeeJet markets these nozzles for irrigation booms that are usually vehicle/tractor mounted. These nozzles have the capabilities to work with their precision spray systems which identify and spray targets as the vehicle moves along the ground. The quick-change nozzle set-up allows us to swap nozzles if the chemical mix, target composition, or environmental conditions dictates using different nozzles.

Risk: Inability to see target causes spraying of targets that should not be sprayed.

a. Mitigation: Airborne Ag systems LLC, has installed a downward-facing, high-resolution camera that enables either the PIC or a second assistant to view the target over which the drone is hovering. This equipment has a long range, allowing Airborne Ag systems LLC operators to be precise in their application, even at great distance.